Published in final edited form as:

J Adolesc Health. 2013 August ; 53(2): 241–248. doi:10.1016/j.jadohealth.2013.02.009.

Role of young women's depression and stress symptoms in their weekly use and nonuse of contraceptive methods

Kelli Stidham Hall, PhD,

Research Investigator, Department of Obstetrics and Gynecology; Institute for Social Research, University of Michigan

Caroline Moreau, MD, PhD,

Assistant Professor, Department of Population, Family and Reproductive Health, Johns Hopkins School of Public Health

James Trussell, PhD, and

Professor of Economics, Director of the Office of Population Research, Princeton University; Visiting Professor, The Hull York Medical School

Jennifer Barber, PhD

Professor of Sociology, Department of Sociology; Research Professor, Population Studies Center, University of Michigan

Abstract

Purpose—We prospectively examined the influence of young women's depression and psychological stress symptoms on their weekly contraceptive method use.

Methods—We examined data from 689 women ages 18–20 years participating in a longitudinal cohort study. Women completed 8,877 weekly journals over the first year, which assessed reproductive, relationship and health information. We focused on baseline depression (Center for Epidemiologic Studies-Depression Scale) and stress (Perceived Stress Scale) symptoms and weekly contraceptive method use. Analyses used multivariate random effects and multinomial logistic regression.

Results—Approximately, one-quarter of women exhibited moderate/severe depression (27%) and stress (25%) symptoms at baseline. Contraception was not used in 10% of weekly journals, while coital and noncoital methods were used in 42% and 48% of weeks, respectively.

In adjusted models, women with moderate/severe stress symptoms had over twice the odds of contraception nonuse than women without stress (OR 2.23, CI 1.02–4.89, $p=0.04$). Additionally, women with moderate/severe depression (RR 0.52, CI 0.40–0.68, $p<0.001$) and stress (RR 0.75, CI 0.58–0.96, $p=0.02$) symptoms had lower relative risks of using long-acting methods than OCs (reference category). Women with stress symptoms also had higher relative risks of using condoms (RR 1.17, CI 1.00–1.34, $p=0.02$) and withdrawal (RR 1.29, CI 1.10–1.51, $p=0.001$) than

© 2013 Society for Adolescent Medicine. Published by Elsevier Inc. All rights reserved.

Kelli Stidham Hall, PhD (corresponding author; reprint requests), 24 Frank Lloyd Wright Dr., P.O. Box 531, Ann Arbor, MI 48106-0445 (t) 734-930-5621 (f) 734-930-5609 (c) 859-533-0762 hkelli@umich.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Disclosure statement: None of the authors have a conflict of interest.

OCs. The relative risk of dual versus single method use was also lower for women with stress symptoms.

Conclusion—Women’s psychological symptoms predicted their weekly contraceptive nonuse and use of less effective methods. Further research can determine the influence of dynamic psychological symptoms on contraceptive choices and failures over time.

Keywords

depression; psychological stress; contraceptive behavior; contraceptive methods; contraceptive nonuse

Introduction

The majority of sexually active young women have used contraception and have access to a variety of safe and effective methods (1). However, problems with contraceptive use are common and perfect use is seldom achieved (2–4). Over 90% of the estimated 3.2 million U.S. unintended pregnancies are attributed to contraceptive nonuse, misuse or discontinuation (2–7).

Contraceptive effectiveness, which takes into account typical use, varies according to method. Oral contraceptives (OC), the most commonly used contraceptive in the U.S., have a 97–98% perfect use efficacy rate (1, 3, 5). Though, as many as 40% of OC users miss one or more pills per month (8, 9) and typical users in the U.S. experience a 9% failure rate in the first year (3). Coital-specific methods are associated with even higher rates of user-related failure. Over 60% of condom users in a recent population-based study reported, within the last three months, not using condoms with every act of intercourse or applying condoms after intercourse had begun (9). Among typical users of condoms, 18% will become pregnant during the first year of use (3).

Selection of an effective contraceptive method is important for all women who want to avoid an unintended pregnancy but is of particular concern for women who may be at risk for user-related method failures (3). Adverse psychological conditions including depression and stress are common and highly comorbid among reproductive-aged women (10, 11) and have been shown to be associated with general medication non-adherence (12, 13). These conditions have also been associated with risky sexual practices including multiple sexual partners, sexually transmitted infection (STI) acquisition, sex while under the influence of drugs and early and unprotected coitarche (14–18).

Psychiatric theory may point to potential mechanisms through which mental health conditions influence contraceptive behavior. Women with depression, anxiety or stress may lack insight into their psychological distress and its impact on daily functioning (19) or have limited cognitive capacities for risk assessment, planning and social learning (19–22). Mental health conditions may diminish perceptions of benefits and threats of a health treatment (e.g. contraception) and susceptibility to a health outcome (e.g. pregnancy)(20). These may also contribute to perceptions of physical symptomatology, leading to perceived side effects of hormonal contraception and subsequent misuse, discontinuation or method switching (23, 24).

While these cognitive processes have potential relevance for family planning decision-making and behavior among women with depression and stress, little is known about how psychological symptoms influence women’s contraceptive method choices, use and nonuse within the context of their daily lives. We sought to prospectively examine the role of young women’s baseline depression and psychological stress symptoms in their weekly use and

nonuse of contraceptive methods. We hypothesized that women with elevated psychological symptoms would be less likely to use contraception consistently or at all as compared to women without symptoms. We also hypothesized that depression and stress would have similar effects on contraceptive behavior given the high levels of comorbidity between the two conditions (10, 11).

Methods

Sample and design

Our data come from a representative population-based cohort study of 992 young women aged 18–20 years residing in a racial/ethnically and socioeconomically diverse Michigan county. Names and contact information were randomly selected from state driver's license and personal identification card registries. Eligible women (age 18–20 and a county resident) were contacted by mail or phone and asked to participate. Sampling occurred between March 2008 and March 2009. This study was approved by the Institutional Review Boards of the University of Michigan and Princeton University.

After informed consent, a trained research assistant conducted a 60-minute inperson baseline survey interview to elicit information on sociodemographics, relationship characteristics, reproductive attitudes, beliefs and intentions, contraceptive histories, and mental health symptoms. Participants were then invited to participate in the weekly journal-based study for a period of 2.5 years. The weekly journal surveys, which measured contraceptive use patterns, relationship status and pregnancy outcomes, were completed online for participants with internet access or by phone if internet access was unavailable on a particular week. Participants were compensated \$1 per weekly survey with \$5 bonuses for on-time completion of five consecutive surveys. Ninety-eight percent of women agreed to participate in the study. The response rate for the full baseline interview was 88%; 78% completed 12 months or more of weekly surveys.

Sample selection is presented in Figure 1. The initial sample comprised 992 women. We focused on contraceptive use during the first 12 months of follow-up. Given that many of our contraceptive method outcomes were coital specific, we examined weekly journal entries in which women were sexually active the previous week in order to estimate contraceptive use among those at risk of pregnancy (i.e. condom nonuse is meaningful only during sexually active weeks); 301 women were excluded because they were not sexually active in any study week. For women who became and remained pregnant during the study, we excluded only their pregnant weekly journals (i.e. they were not at risk of pregnancy); 59 women were pregnant during all completed journal weeks and were excluded. Finally, we excluded women who were missing pertinent contraceptive information (n=3); these women did not differ in regards to baseline characteristics from the final sample. Our final analytic sample included 689 women who completed 8,877 weekly journals during the first 12 months (mean journals per woman 58, range 2–146).

Measures

Psychological symptoms—Abbreviated versions of standardized depression and psychological stress instruments were administered during the baseline interview.

The Center for Epidemiologic Studies – Depression Scale-5 (CES-D-5) is an abbreviated screening tool that assesses depressive symptoms over the previous week (25–28). Women were asked how often they felt the following five symptoms over the past 7 days: “like you could not shake off the blues,” “depressed,” “sad,” “life was not worth living,” and “happy.” Responses were scored on a 4-point scale (0=rarely or none of the time, 1=some or little of

the time, 2=occasionally or moderate amount of time, 3=most or all of the time); the positively worded item was reverse coded. Items were then summed for a total depression score. Scores range from 0–15; a higher score indicates a higher degree of symptoms. We used a standardized cut-off of 4 points to denote moderate/severe depression symptoms (one standard deviation above the population mean)(28).

The Perceived Stress Scale (PSS-4) is a global psychological stress screen that assesses the degree to which life situations are appraised as stressful, unpredictable, uncontrollable, and overloading over the previous month (29–30). Women were asked how often (0=never, 1=almost never, 2=sometimes, 3=fairly often, 4=very often) they felt the following 4 symptoms: “unable to control important things in life,” “confident about ability to handle personal problems,” “things were going your way,” and “difficulties were piling up so high that you could not overcome them.” Positively worded items were reverse coded. Items were summed for a total score, which could range from 0–16 with higher scores indicating greater stress. We used the standardized cut-off of 9 points (one standard deviation above population mean) to denote moderate/severe stress symptoms (29–30).

Contraceptive use—At baseline, women were asked about previous and current use of any non-coital contraceptive method (OCs, contraceptive patch, ring, injectable, implant, or intrauterine device (IUD)). For this analysis, we categorized the IUD, injectable or implant as long-acting contraceptive methods.

In each weekly survey, women were asked if they had been sexually active the previous week and if so, were then asked whether they had used a non-coital method (listed above) or coital-specific method (condoms, withdrawal, or other coital methods including diaphragm/cervical cap, spermicide, female condom, emergency contraception (EC), rhythm calendar method or other non-specified method) during the week since the last survey.

We examined three primary weekly contraceptive use variables: 1) nonuse of a contraceptive method versus any method use (non-coital or coital methods), 2) specific types of contraceptive methods used, and 3) single versus dual method use. For specific contraceptive method use among women who reported using contraception, we created a categorical variable of “most effective method” in which women were top-coded to their most effective method used: 1) long-acting methods, 2) OCs, 3) contraceptive ring or patch, 4) condoms, 5) other coital methods, and 6) withdrawal. Single versus dual contraceptive method use included the following categories: 1) a single method alone, which was the reference category, 2) OCs AND condoms, 3) other noncoital methods (long-acting methods/ring/patch) AND condoms, 4) OCs AND withdrawal, and 5) other noncoital methods (long-acting methods/ring/patch) AND withdrawal.

Covariates—Sociodemographic characteristics including age, race/ethnicity, educational attainment (type of school currently enrolled), employment status, public assistance recipient, and frequency of religious service attendance, relationship status (married, engaged, in special romantic relationship, having physical/emotional contact with someone or none) and cohabitation status (with marital or non-marital partner) were assessed at baseline. Women were asked whether they had ever had sexual intercourse, their age at coitarche, and lifetime number of sexual partners. Gravidity (none, one, two or more pregnancies) and current pregnancy status was assessed at baseline; current pregnancy status (self-reported positive test or reported being “probably pregnant”) and sexual activity were reassessed weekly.

Statistical analysis—We used univariate and bivariate (X^2 tests and student’s t-tests) statistics to describe sociodemographic and reproductive characteristics, to estimate

women's baseline psychological conditions and weekly contraceptive method use (for each contraceptive variable) and to compare: 1) proportions of moderate/severe baseline psychological conditions and contraceptive method use across participants' sociodemographic characteristics; and 2) proportions of contraceptive method use among women with and without moderate/severe psychological conditions. Using random effects multivariable logistic regression models to account for unobserved respondent-level heterogeneity (the clustering of observations by woman), we first examined the effect of baseline depression and stress symptoms on weekly contraceptive nonuse. We controlled for baseline sociodemographic and reproductive characteristics. We also controlled for the number of weekly journals each woman completed as a indicator of time (i.e. effects of repeated exposure to the questionnaire and continued participation in the study).

We further examined the influence of psychological symptoms on the risks of using specific contraceptive methods with multinomial logistic regression (OCs were the reference category). Results are presented as adjusted odds ratios (OR) and relative risk ratios (RR) with 95% confidence intervals (CI) and p-values (p). A two-tailed alpha of 0.05 was considered significant. All data were analyzed using Stata 11.0 (StataCorp LP, College Station, TX).

Results

Sample baseline sociodemographic and reproductive characteristics (Table 1)

Women were ages 18 (43%), 19 (49%) and 20 (8%) years old at enrollment. The majority identified as white (58%) or black (32%) race/ethnicity. Over half of women were enrolled in a 4-year (25%) or 2-year (29%) college or vocational/technical school. Many women were employed (51%) though 28% were receiving public assistance. Weekly religious services attendance was reported by 21% of women. Over half (57%) were in a special romantic relationship; 21% were living with a romantic partner and 11% were married or engaged. One fifth of women (20%) had experienced coitarche at age 14 years and 39% reported having 4 lifetime sexual partners; 25% had a history of pregnancy. Nearly all women (88%) had used contraception in the past but 51% had unprotected intercourse experience. Contraceptive use at enrollment was reported by 60% of women, with OCs being the most common method used (36%).

Baseline psychological symptoms

The sample's mean ($\pm$ standard deviation) baseline CES-D-5 depression and PSS-4 stress scores were 3 ± 3 points (range 0–15) and 6 ± 3 points (range 0–15), respectively; 27% (n=185) and 25% (n=173) of women met criteria for moderate/severe depression (≥ 4 points) and stress (≥ 9 points) symptoms. Young women's depression and stress symptoms were correlated: 62% of women with moderate/severe depression symptoms also had moderate/severe stress symptoms ($p<0.001$, Pearson's $r=0.51$). Having moderate/severe depression symptoms was associated with race/ethnicity ($p=0.002$), educational enrollment ($p=0.005$), number of sexual partners ($p=0.02$), age at coitarche (<0.001), and gravidity ($p=0.009$): black women, high school drop-outs, women with a younger age at coitarche, more lifetime sexual partners and multi-gravidous women had greater depression symptoms than their counterparts. Similarly, having moderate/severe stress symptoms was associated with lifetime number of sexual partners ($p=0.001$) and age at coitarche ($p=0.003$): women with more sexual partners and younger coitarche had greater stress symptoms than their counterparts.

Weekly contraceptive method use

Of the 8,877 weeks (journals) in which women (n=689) were at risk of unintended pregnancy (sexually active and not pregnant) during the first year of follow-up, 878 weeks (10%) were not covered by a contraceptive method while contraception was used 90% of the time: 48% of woman-weeks were covered by non-coital method and 42% by a coital-specific method alone. For the most effective methods used among weeks in which women reported contraceptive use (n=7,999), women used long-acting methods including injectable (6%), IUD (<1%) and implant (<1%), OCs (44%), other hormonal methods including the ring (1%) and patch (1%), condoms (27%), other coital methods (1%) and withdrawal (17%). In 96 journals, method type was not specified. For dual method use, 18% of weeks were covered by OCs AND condoms, 3% by other noncoital methods (long-acting/ring/patch) AND condoms, 14% by OCs AND withdrawal, and 3% by other noncoital methods (long-acting/ring/patch) AND withdrawal. Use of a single method alone was reported in 63% of weeks.

Weekly contraceptive method use varied across all of women's sociodemographic and reproductive characteristics including age, race/ethnicity, educational attainment, employment status, receipt of public assistance, relationship and cohabitation status, religious service attendance, age at coitarche, number of lifetime sexual partners, and number of pregnancies (all p-values <0.001) (Table 1).

Unadjusted associations between baseline psychological symptoms and weekly contraceptive method use

In unadjusted analyses, baseline depression and stress symptoms were associated with weekly contraceptive nonuse and with specific methods used (all p-values<0.001) (Table 2). Women with moderate/severe depression and stress symptoms had higher proportions of weeks in which no contraceptive was used (13% and 14%, respectively) compared to those without depression and stress symptoms (9% and 9%). Women with moderate/severe depression and stress symptoms also had lower proportions of using non-coital methods (42% and 42%, respectively) than women without moderate/severe psychological symptoms (50% and 51%). When comparing the most effective specific methods used, women with moderate/severe psychological symptoms had lower proportions of using long-acting methods and OCs but higher proportions of condom use than women without psychological symptoms (Table 2). However, slightly higher proportions of other hormonal method use (ring/patch) were noted among women with depression and stress symptoms versus those without (4% versus 2% for both depression and stress). Additionally, compared to women without moderate/severe depression and stress symptoms, those with symptoms had higher proportions of using a single contraceptive method alone (62% and 60% versus 65% and 70%, respectively) and lower proportions of nearly all combinations of dual method use (Table 2).

Relationships between baseline psychological symptoms and weekly contraceptive method use

In random effects multivariate logistic regression models, women with moderate/severe stress had twice the odds of contraceptive nonuse than women without moderate/severe stress (OR 2.23, CI 1.02-4.89, p=0.04) (Table 3). Among women who used contraception, moderate/severe depression and stress symptoms were associated with using less effective methods each week (Table 4). For women with moderate/severe depression (RR 0.52, CI 0.40-0.68, p<0.001) and stress (RR 0.75, CI 0.58-0.96, p=0.02) symptoms, the relative risk of using long-acting methods was lower than for OCs (reference). Women with stress symptoms had higher relative risks of using condoms (RR 1.17, CI 1.00-1.34, p=0.02) and withdrawal (RR 1.29, CI 1.10-1.51, p=0.001) than OCs. The relative risk of using the ring/

patch versus OCs was higher for women with both depression (RR 2.75, CI 1.90-4.00, $p<0.001$) and stress (RR 2.92, CI 2.11-4.05, $p<0.001$) symptoms. The relative risks of nearly all combinations of dual method use were lower than for single method use among women with moderate/severe stress symptoms (Table 4). Other sociodemographic factors significantly associated with contraceptive nonuse and specific method use in multivariate models included educational attainment and employment status (Table 3).

Discussion

Ours is the first study of which we are aware to prospectively measure weekly method choice *and* sexual activity among a population-based cohort. Building upon other researchers' work of contraceptive method use (1), we found that OCs and condoms were consistently young women's preferred contraceptives each week. However, 10% of these women's weeks were not covered by a contraceptive method. Our findings provide new insights into contraceptive nonuse and specific method use patterns among women at risk of pregnancy each week.

We found that psychological stress symptoms predicted weekly nonuse of contraceptive methods. Others who have noted associations between psychological distress and contraceptive nonuse among young cohorts (20–24, 31), though these studies have used cross-sectional or retrospective designs and focused on unprotected intercourse at coitarche or at last sexual encounter (20–24, 31). By using a prospective, longitudinal approach and assessing sexual activity each week, we found that stressed women at risk of pregnancy had over twice the odds of not using contraception than women without elevated stress symptoms.

Women's moderate/severe psychological symptoms also predicted use of less effective contraceptive methods. Women with moderate/severe depression and stress symptoms had lower relative risks of using long-acting methods than compared to OCs; those with stress symptoms also had higher relative risks of using coital methods like condoms and withdrawal. While condom use is important for preventing STIs among women with mental health symptoms, use of the most effective methods to prevent unintended pregnancy is also of priority (33). Unfortunately, only 21% of weeks were covered by dual use of an effective contraceptive method *and* condoms.

Using clinic-based data from 2,476 predominantly black and Latina women (ages not specified) in New York City, Garbers *et al.* found that women screening positive for depression (Patient Health Questionnaire-9) had 45% higher odds of selecting condoms and 39% lower odds of selecting hormonal methods at their clinic visit compared to women without depressive symptoms (32). In another study using cross-sectional national data from 53,255 women ages 18 and older in the Behavioral Risk Factor Surveillance System, Farr *et al.* found that low income women with frequent mental distress (measured by days of "not good mental health" in the past month) had lower odds of using long-acting/hormonal methods (OR 0.5) and condoms (OR 0.6) than other less effective methods (33). Overall, our prospective study builds upon this retrospective and cross-sectional work to highlight associations between psychological symptoms and women's weekly contraceptive method use patterns, suggesting that young women's depression and stress symptoms may negatively influence their weekly contraceptive behavior and choices.

Unfortunately, like the other studies, ours did not ascertain reasons for contraceptive nonuse or specific method choices. Thus, data do not illuminate why women with psychological symptoms may resort to less effective methods or forgo contraception altogether each week. It may be that women with psychological symptoms are more likely to perceive or fear side

effects and long-term consequences of hormonal or long-acting methods, potentially deterring them from using more effective contraception (34). It may also be that these women wish to avoid or are unable to cope with the behavioral diligence required of many user-dependent options like OCs (33). Alternatively, depression and stress may negatively interact with cognitive processes and decision-making around contraception and sexual behavior (18). These hypotheses require further study.

Our study had several notable limitations. Small sub-samples limited adequate assessment of certain contraceptive methods, particularly the ring and patch. While a 78% response rate for 12 months of weekly journal surveys is reasonable, we recognize the potential for bias due to differential attrition. Contraceptive use data were based upon women's self-report. Our psychological variables were measured at baseline, so we were unable to evaluate time-varying relationships between dynamic psychological symptoms and contraceptive use. Other important health and medication history characteristics, which may have been influenced women's contraceptive method selection, were not assessed. Finally, our sample was not representative of the greater U.S. population, which limits generalizability.

Conclusion

Our study suggests that young women with elevated stress symptoms are at risk of contraceptive nonuse; those with depression and stress symptoms are at risk of using less effective methods each week. Routine screening for mental health symptoms can help clinicians to identify women with depression or stress who may be at risk for contraceptive non-use and misuse. Women's psychological symptoms require clinical consideration for selection, initiation, management or switching of specific contraceptive methods. For women with mental health conditions, use of highly effective methods that require little user burden such as long-acting reversible contraception may provide strong method options to promote adherence. Though, specific education, counseling and intervention strategies for method selection and adherence in the context of mental health require further study.

We are currently examining other time-varying characteristics, such as changes in women's relationship status, patterns of sexual activity (an inactivity) and unintended pregnancy experiences, for a more complete understanding of women's dynamic psychosocial circumstances surrounding their family planning experiences. Future research using more comprehensive measures of dynamic depression and stress symptoms can provide insight into how mental health symptoms impact women's contraceptive behaviors and outcomes over time.

Acknowledgments

funding Source: This work was supported by the National Institute of Child Health and Human Development for grant #R01-HDHD050329 (P.I. Barber, University of Michigan), by an NICHD Building Interdisciplinary Careers in Women's Health K-12 Career Development grant (project P.I. Hall, #K12HD001438), and by NICHD center grant for Infrastructure for Population Research at Princeton University (Trussell and Hall while she was a postdoctoral research fellow at Princeton University, #R24HD047879).

References

1. Mosher WD, Jones J. Use of contraception in the United States: 1982–2008. *Vital Health Stat.* 2010; 23:1–43.
2. Kost K, Singh S, Vaughan B, Trussell J, Bankole A. Estimates of contraceptive failure from the 2002 National Survey of Family Growth. *Contraception.* 2008; 77:10–21. [PubMed: 18082661]
3. Hatcher, RA.; Trussell, J.; Stewart, F., et al. *Contraceptive Technology.* 20th revised edition. New York: Ardent Media; 2004.

4. Finer LB, Henshaw SK. Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Persp Reprod Health*. 2006; 38:90–96.
5. Abma JC, Martinez GM, Copen CE. Teenagers in the United States: Sexual activity, contraceptive use and childbearing, 2002. *Vit Health Stats*. 2004; 23:1–87.
6. Alan Guttmacher Institute. Teen pregnancy: trends and lessons learned. New York: Guttmacher Report on Public Policy; 2002.
7. Alan Guttmacher Institute. U.S. teenage pregnancy statistics: overall trends, trend by race and ethnicity, and state-by-state information. New York: 2004.
8. Rosenberg MJ, Waugh MS, Long S. Unintended pregnancies and use, misuse and discontinuation of oral contraceptives. *J Reprod Med*. 1995; 40:355–360. [PubMed: 7608875]
9. Frost JJ, Darroch JE. Factors associated with contraceptive choice and inconsistent method use, United States 2004. *Persp Sex Reprod Health*. 2008; 40:94–104.
10. American Psychiatric Association (APA). Diagnostic and Statistical Manual of Mental Disorders. 4th edition. Washington, DC: 2000.
11. National Adolescent Health Information Center (NAHIC). University of California, San Francisco. Adolescents. San Francisco, CA: Fact sheet on demographics; 2003.
12. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: Meta-analysis of the effects of anxiety and depression on patient adherence. *Arch Intern Med*. 2000; 160:2101–2107. [PubMed: 10904452]
13. Osterberg L, Blascke T. Adherence to medication. *NEJM*. 2005; 353:487–497. [PubMed: 16079372]
14. Chen YW, Stiffman AR, Cheng LC, Dore P. Mental health, social environment and sexual risk behaviors of adolescent service users: a gender comparison. *J Child Fam Stud*. 1997; 6:9–25.
15. Burns JJ, Cottrell L, Perkins K, et al. Depressive symptoms and health risk among rural adolescents. *Pediatrics*. 2004; 113:1313–1320. [PubMed: 15121947]
16. Brooks TL, Harris SK, Thrall JS, Woods ER. Association of adolescent risk behaviors with mental health symptoms in high school students. *J Adolesc Health*. 2002; 31:240–246. [PubMed: 12225736]
17. Bennett IM, Culhane JF, McCollum KF, Elo IT. Unintended rapid repeat pregnancy and low education status: Any role for depression and contraceptive use? *Obstet Gynecol*. 2006; 194:749–754.
18. Lehrer JA, Shrier LA, Gortmaker S, Buka S. Depressive symptoms as longitudinal predictors of sexual risk behaviors among US middle and high school students. *Pediatrics*. 2006; 118:189–200. [PubMed: 16818565]
19. Amador XF, Flaum M, Andreasen NC, et al. Awareness of illness in schizophrenia and schizoaffective and mood disorders. *Arch Gen Psych*. 1994; 51:826–836.
20. Ruscher S, de Wit R, Mazimani D. Psychiatric patients' attitudes about medication and factors affecting noncompliance. *Psych Services*. 1997; 48:82–85.
21. Patel MS, David AS. Medication adherence: predictive factors and enhancement strategies. *Psychiatry*. 2004; 3:41–44.
22. Calev, A. Assessment of Neuropsychological Functions in Psychotic Disorders. Washington DC: American Psychiatric Press; 1999.
23. Barsky AJ, Saintfort R, Rogers MP, Borus JF. Nonspecific medication side effects and the Nocebo phenomenon. *JAMA*. 2002; 287:22–27.
24. Katon W, Lin E, Von Korff M, et al. Somatization: A spectrum of severity. *Am J Psych*. 1991; 148:34–40.
25. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psych Meas*. 1977; 1:385–401.
26. Radloff LS. The use of the Center for Epidemiologic Studies Depression Scale in adolescents and young adults. *J Youth Adolesc*. 1991; 20:149–166.
27. Testa CR, Steinberg L. Depressive symptoms and health-related risk-taking in adolescence. *Suicide Life-threatening Behav*. 2010; 40:298–305.

28. Zauszniewski JA, Graham GC. Comparison of short scales to measure depressive symptoms in elders with diabetes. *Western J Nurs Res*. 2009; 31:219–235.
29. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983; 24:385–396. [PubMed: 6668417]
30. Cohen, S.; Williamson, G. Perceived stress in a probability sample of the United States. In: Spacapan, S.; Oskamp, S., editors. *The social psychology of health: Claremont Symposium on applied social psychology*. Newbury Park, CA: Sage; 1988. p. 31-67.
31. Berenson AB, Breitkopf CR, Wu ZH. Reproductive correlates of depressive symptoms among low-income minority women. *Obstet Gynecol*. 2003; 102:1310–1311. [PubMed: 14662220]
32. Garbers S, Correa N, Tobier N, Blust S, Chiasson MA. Associations between symptoms of depression and contraceptive method choices among low-income women at urban reproductive health centers. *Matern Child Health*. 2010; 14:102–109.
33. Farr SL, Curtis KM, Robbins CL, Zapata LB, Dietz PM. Use of contraception among US women with frequent mental distress. *Contraception*. 2011; 83:127–133. [PubMed: 21237337]
34. Segebladh B, Borgstrom A, Odland V, Bixo M, Sundstrom-Poromaa I. Prevalence of psychiatric disorders and premenstrual dysphoric symptoms in patients with experience of adverse mood during treatment with combined oral contraceptives. *Contraception*. 2009; 79:50–55. [PubMed: 19041441]

Implications and contribution statement

Young women with elevated psychological stress symptoms were at risk for weekly contraceptive nonuse. Those with depression and stress symptoms were also at risk of using less effective contraceptive methods over time. Findings have implications for further evaluation of the relationship between dynamic psychological symptoms, contraceptive behavior and unintended pregnancy.

Figure 1.
Selection of the Sample

Table 1

Weekly contraceptive method use by women's baseline demographic, social and reproductive characteristics

Baseline characteristics	Percentage of weeks of contraceptive method use including nonuse (n=8,877)							P-value
	None (n=878, 10%)	Condoms (n=2,128, 24%)	Withdrawal (n=1366, 15%)	Other Coital ^a (n=106, 1%)	OCs (n=3537, 40%)	Ring or Patch (n=195, 2%)	Long- acting ^b (n=572, 6%)	
Full sample (n=689 women)								
Age								<0.001
18 years (n=291, 43%)	12	24	13	2	40	2	6	
19 years (n=340, 49%)	9	23	19	1	40	2	6	
20 years (n=58, 8%)	3	28	7	1	44	<1	14	
Race/ethnicity								<0.001
Non-Hispanic White (n=397, 58%)	10	22	15	1	45	2	6	
Non-Hispanic Black (n=218, 32%)	13	33	15	2	26	1	11	
Hispanic (n=58, 8%)	3	21	16	2	47	7	3	
Asian/Other (n=16, 2%)	11	17	30	0	27	3	8	
Educational enrollment								<0.001
Not enrolled (n=162, 24%)	14	25	18	1	36	1	4	
High school (n=90, 13%)	17	27	15	2	30	1	8	
2 year college (n=201, 29%)	7	22	19	1	40	2	8	
4 year college (n=174, 25%)	4	21	9	1	55	4	6	
High school drop-out (n=62, 9%)	26	30	23	1	11	2	7	
Employment status								<0.001
Employed (n=354, 51%)	7	22	14	1	47	2	6	
Unemployed (n=335, 49%)	13	25	17	2	33	2	7	
Receiving public assistance								<0.001
Yes (n=191, 28%)	15	30	16	2	23	2	12	
No (n=498, 72%)	8	22	15	1	45	2	5	
Frequency of religious service attendance								<0.001

Baseline characteristics	Percentage of weeks of contraceptive method use including nonuse (n=8,877)						P-value
	None (n=878, 10%)	Condoms (n=2,128, 24%)	Withdrawal (n=1366, 15%)	Other Coital ^a (n=106, 1%)	OCs (n=3537, 40%)	Ring or Patch (n=195, 2%)	Long- acting ^b (n=572, 6%)
Full sample (n=689 women)							
Never (n=156, 23%)	10	24	10	1	41	4	10
< weekly (n=386, 56%)	10	20	20	1	42	1	4
weekly (n=147, 21%)	6	34	9	2	35	3	9
Relationship status							<0.001
Married (n=13, 2%)	8	20	10	1	40	0	21
Engaged (n=62, 9%)	13	25	20	4	31	3	5
Special romantic relationship (n=390, 57%)	10	21	13	1	44	3	7
Physical/emotional contact (n=120, 17%)	10	31	23	1	30	1	5
None (n=104, 15%)	6	27	14	1	44	1	6
Cohabitation status							<0.001
Cohabiting (n=145, 21%)	15	17	21	2	36	2	6
Not cohabiting (n=544, 79%)	8	25	13	1	42	2	7
Age at first vaginal intercourse							<0.001
No sex at enrollment (n=62, 9%)	3	41	10	3	40	2	1
< 14 years (n=138, 20%)	15	23	16	2	30	4	9
15–16 years (n=289, 42%)	10	20	18	1	43	2	6
17 years (n=200, 29%)	8	26	12	1	45	2	7
Lifetime number of sexual partners							<0.001
0 (n=62, 9%)	3	41	10	3	40	2	1
1 (n=134, 20%)	8	22	10	1	50	3	6
2 (n=106, 15%)	10	27	16	1	31	5	11
3 (n=118, 17%)	8	21	14	2	45	2	7
4 (n=269, 39%)	12	22	20	1	38	1	6
Pregnancies							<0.001
0 (n=519, 75%)	8	23	14	1	46	2	5

Baseline characteristics	Percentage of weeks of contraceptive method use including nonuse (n=8,877)							P-value
	None	Condoms	Withdrawal	Other Coital ^a	OCs	Ring or Patch	Long-acting ^b	
Full sample (n=689 women)	(n=878, 10%)	(n=2,128 24%)	(n=1366, 15%)	(n=106, 1%)	(n=3537, 40%)	(n=195, 2%)	(n=572, 6%)	
1 (n=113, 16%)	15	26	23	1	19	1	13	
2 (n=57, 8%)	18	29	11	3	21	5	12	

Results are presented as percentages of weekly use of each contraceptive method (including nonuse) by women's demographic, social and reproductive characteristics. Weekly use of contraception is exclusive and top-coded to the most effective method used that week. Comparisons across sociodemographic groups are with chi-square analysis, alpha significant <0.05.

^a Other coital methods includes spermicide, diaphragm, female condom, rhythm calendar method, emergency contraception, or other methods.

^b Long-acting methods include IUD, implant or injectable. In 96 journals, method type was not specified.

Table 2
Weekly contraceptive method use by moderate/severe depression and stress symptoms

Proportion of weekly contraceptive method use by women's baseline moderate/severe psychological symptoms						
	Depression symptoms			Stress symptoms		
	Moderate/severe (4pts CES-D) (n=185 women)	< Moderate/severe (<4pts CES-D) (n=504 women)	p-value	Moderate/severe (9pts PSS-4) (n=173 women)	< Moderate/severe (<9pts PSS-4) (n=516 women)	p-value
Contraceptive method use * (n=8,877 weeks)			<0.001			<0.001
None (n=878)	13	9		13	9	
Coital (n=3,695)	45	41		45	41	
Noncoital (n=4,304)	42	51		42	50	
Most effective method used * (n=7,999)			<0.001			<0.001
^a Long-acting (n=571)	6	8		6	8	
OCs (n=3,537)	40	46		39	46	
Ring or patch (n=195)	4	2		4	2	
Condoms (n=2,128)	30	26		29	26	
^b Other coital (n=106)	2	1		2	1	
Withdrawal (n=1,366)	19	17		20	17	
Single versus dual method use * (n=7,999)			0.002			<0.001
Single method only (n=5020)	65	62		70	60	
OCs AND condoms (n=1427)	16	18		14	19	
Other noncoital methods (long-acting/ring/patch) AND condoms (n=1427)	4	3		2	3	
OCs AND withdrawal (n=1105)	13	14		12	15	
Other noncoital methods (long-acting/ring/patch) AND withdrawal (n=205)	2	3		3	3	

Center for Epidemiologic Studies – Depression Scale (CES-D-5). Perceived Stress Scale - 4 (PSS-4). Results are presented as proportions of contraceptive method use among women with and without moderate/severe psychological symptoms. P-values from unadjusted chi-square tests significant at alpha <0.05.

* Categorical results for contraceptive outcomes are exclusive and top-coded to most effective method reported. In 96 journals method type was not specified.

^aLong-acting methods include IUD, implant or injectable.

^bOther coital methods includes spermicide, diaphragm, female condom, rhythm calendar method, emergency contraception, or other methods.

Table 3

Effect of depression and stress symptoms on weekly nonuse of contraception

	Odds of contraceptive nonuse among women with moderate/severe depression symptoms ^a OR (95% CI) p-value	Odds of contraceptive nonuse among women with moderate/severe stress symptoms ^b OR (95% CI) p-value
Less than moderate psychological symptoms	ref	ref
Moderate/severe psychological symptoms	1.29 (0.59–2.83) 0.53	2.23 (1.02–4.89) 0.04
Sociodemographic and reproductive covariates		
Age		
18 years	ref	ref
19 years	0.98 (0.47–2.05) 0.96	0.97 (0.46–2.03) 0.93
20 years	0.88 (0.23–3.33) 0.84	0.93 (0.25–3.50) 0.92
Race/ethnicity		
White	ref	ref
Black	1.31 (0.57–3.01) 0.52	1.31 (0.57–3.00) 0.52
Hispanic	0.36 (0.09–1.53) 0.17	0.36 (0.09–1.48) 0.15
other	1.74 (0.21–14.02) 0.61	2.01 (0.25–16.42) 0.52
Education enrollment		
Not enrolled	ref	ref
High school	1.40 (0.45–4.36) 0.56	1.51 (0.48–4.72) 0.58
2-year college	0.45 (0.17–1.15) 0.10	0.49 (0.19–1.26) 0.14
4 year college	0.17 (0.05–0.49) 0.001	0.18 (0.06–0.53) 0.002
High school drop-out	1.52 (0.43–5.38) 0.51	1.58 (0.45–5.58) 0.48
Employment status		
Unemployed	ref	ref
Employed	0.43 (0.21–0.89) 0.02	0.43 (0.21–0.89) 0.02
Receiving public assistance		
No	ref	ref
Yes	1.61 (0.69–3.74) 0.27	1.78 (0.76–4.12) 0.18
Frequency of religious service attendance		
Never	ref	ref
< weekly	1.43 (0.60–3.38) 0.42	1.48 (0.62–3.51) 0.38
weekly	0.47 (0.15–1.53) 0.21	0.43 (0.13–1.41) 0.17
Age at coitarche		
No sexual intercourse experience at enrollment	ref	ref
< 14 years	3.94 (0.77–20.10) 0.10	3.13 (0.61–16.13) 0.10
15–16 years	1.66 (0.35–7.88) 0.53	1.42 (0.29–6.78) 0.53
17 years	1.49 (0.28–7.93) 0.65	1.21 (0.23–6.54) 0.65

	Odds of contraceptive nonuse among women with moderate/severe depression symptoms ^a OR (95% CI) p-value	Odds of contraceptive nonuse among women with moderate/severe stress symptoms ^b OR (95% CI) p-value
Lifetime number of sexual partners		
0	ref	ref
1	0.66 (0.23–1.90) 0.44	0.73 (0.25–2.11) 0.56
2	0.69 (0.23–2.04) 0.51	0.79 (0.26–2.34) 0.67
3	0.59 (0.22–1.57) 0.29	0.63 (0.24–1.67) 0.35
Number of pregnancies		
0	ref	ref
1	1.47 (0.55–3.89) 0.44	1.46 (0.55–3.88) 0.45
2	2.93 (0.80–10.65) 0.10	3.00 (0.99–1.02) 0.09

N=689 women; 8,877 weeks. Results are presented as odds ratios (OR) with 95% confidence intervals (CI) and p-values from full multivariable random effects logistic regression illustrating the effect of moderate/severe depression and stress symptoms on weekly nonuse of a contraception. Reference category is use of a contraceptive method. All regression models with random effects for woman-specific effects and controlling for number of journal completed. Depression and stress variables entered into separate models.

^aCenter for Epidemiologic Studies – Depression Scale (CES-D-5) – 4 point cut-off for moderate/severe depression symptoms.

^bPerceived Stress Scale - 4 (PSS-4) - 9-point cut-off for moderate/severe stress symptoms.

Table 4

Effect of depression and stress symptoms on weekly use of specific contraceptive methods

Relative risks of weekly contraceptive method use for women with psychological symptoms		
Specific contraceptive methods used each week among women reporting contraceptive use N=689 women, 7,999 weeks	Effect of moderate/ severe depression symptoms (4points) RR (95% CI) p-value	Effect of moderate/ severe stress symptoms (9 points) RR (95% CI) p-value
Oral contraceptives	ref	ref
Long-acting methods ^a	0.52 (0.40–0.68) <0.001	0.75 (0.59–0.96) 0.02
Contraceptive ring or patch	2.75 (1.90–4.00) <0.001	3.00 (2.11–4.05) <0.001
Condoms	1.02 (0.88–1.17) 0.84	1.17 (1.02–1.34) 0.02
Other coital methods ^b	1.30 (0.84–2.04) 0.24	1.45 (0.92–2.27) 0.11
Withdrawal	0.88 (0.75–1.04) 0.14	1.29 (1.10–1.51) 0.001
Single or dual method use each week N=689 women, 7,999 weeks		
Single method only	ref	ref
Oral contraceptives AND condoms	0.99 (0.84–1.16) 0.88	0.71 (0.61–0.83) <0.001
Other noncoital methods (long-acting/ring/patch) AND Condoms	1.15 (0.84–1.59) 0.38	0.65 (0.46–0.93) 0.02
Oral contraceptives AND withdrawal	1.24 (1.04–1.48) 0.02	0.76 (0.64–0.90) 0.002
Other noncoital methods (long-acting/ring/patch) AND withdrawal	1.29 (0.86–1.93) 0.23	1.21 (0.85–1.71) 0.29

Results are presented as relative risk ratios (RR) with 95% confidence intervals (CI) and p-values from reduced multinomial logistic regression models illustrating the effect of moderate/severe depression and stress symptoms on weeks of specific contraceptive method use among women who reported using contraception. Contraceptive method outcomes are categorical and top-coded to most effective method reported: method use is exclusive – women are counted in only one category for specific methods and for single vs. dual method use. Reference categories are the most frequently reported categories: oral contraceptive use and single method use.

^aLong-acting methods include IUD, implant or injectable.

^bOther coital methods includes spermicide, diaphragm, female condom, rhythm calendar method, emergency contraception, or other methods. Method type was not specified in 96 weekly journals. Results are from reduced multinomial regression models controlling for woman effect, number of journals completed, education, employment status, religious participation, number of sexual partners and number of pregnancies. Depression and stress variables were entered into separate models.